restoration ground water quality declined as compared with baseline water chemistry in the PAAs for which post-restoration chemistry is available. However, this decline in quality did not change the classification of water in these PAAs, as baseline sampling had placed them outside the limits of safe drinking water before mining.

Table 1: Ground-water Chemistry of Texas In Situ Uranium Production Authorization Areas

Analyte	EPA & TCEQ MCL Standards (mg/L)	Number of PAAs Where Average Baseline Exceeded MCL/total # of PAAs & Percentage		Number of PAAs Where Amended Restoration Table Values Exceeded MCL/total # of PAAs & Percentage		PAAs where Amended Restoration Values Exceeded Baseline		PAAs Where Amended Restoration Values Were Below Baseline	
EPA & TCEQ Primary Maximum Contaminant Levels (MCLs):									
Arsenic	0.010	45/73	62 %	42/53	79 %	25/53	47 %	0/53	0 %
Cadmium	0.005	21/73	29%	14/53	26%	5/53	9 %	0/53	0 %
Fluoride	4.00	0/73	0%	0/52	0 %	22/51	43 %	1/51	2 %
Lead	0.02	35/73	48%	24/53	45%	5/53	9 %	4/53	7 %
Mercury	0.002	6/73	8%	5/53	9 %	4/53	7 %	1/53	2 %
Nitrate	10	1/77	1%	0/53	0 %	11/53	21 %	3/53	6 %
Selenium	0.05	7/73	10%	18/53	34 %	28/53	53 %	0/53	0 %
Radium ($^{226\ \&\ 228}$Ra: pCi/L)	5 pci/l	71/71	100%	49/49	100%	31/49	63 %	1/49	2 %
Uranium	0.03	66/73	90%	51/53	96 %	47/53	89 %	0/53	0 %
TCEQ Secondary Recommended Standards:									
Sulfate	300	9/77	12 %	12/53	23 %	44/53	83 %	0/53	0 %
Chloride	300	54/77	70 %	34/53	64%	13/53	24 %	3/53	6 %
Total Dissolved Solids	1000	48/73	66 %	36/53	68 %	24/53	45 %	3/53	6 %
Iron	0.30	32/72	44 %	29/53	55 %	9/52	17 %	2/52	4 %
Manganese	0.050	37/73	51%	44/53	83 %	31/53	58 %	1/53	2 %
No Established MCLs or Standards:		Baseline Range		Post-Restoration Range					
Calcium	-	0.2 - 395		14.7 - 317		50/58	86 %	1/58	2 %
Magnesium	-	0.48 - 150.0		3 - 150		36/52	69 %	1/52	2 %
Sodium	-	174 - 2,356		174 - 2,356		14/52	27 %	2/52	4 %
Potassium	-	6.38 - 101.1		6.8 - 101		24/52	46 %	3/52	6 %
Carbonate	-	0.10 - 38		0 - 130		1/22	4 %	1/22	4 %
Bicarbonate	-	125 - 500		225 - 4,480		42/50	84 %	0/50	0 %
Silica	-	15 - 98		17 - 110		9/52	17 %	0/52	0 %
Conductivity (umhos/cm)	-	1,110 - 11,160		1,110 - 4,566		19/42	45 %	1/42	2 %
Alkalinity (as $CaCO_3$)	-	24 - 349		149 - 550		29/38	76 %	0/38	0 %
Molybdenum	-	0.01 - 2.53		0.01 - 5.0		39/52	75 %	0/52	0 %
Ammonia-N	-	0.01 - 7.49		0.01 - 240		22/53	42 %	5/53	9 %

pH not evaluated as it was reported in ranges that overlapped standards

TCEQ Tables accepted as compiled; data discrepancies may exist and should be field checked against original reports

TCEQ = Texas Commission of Environmental Quality, EPA = U.S. Environmental Protection Agency

8) Summary

ISR-amenable uranium deposits are an important domestic energy resource for the U.S. Thirty-eight percent of the reasonably assured resources of uranium that could be economically extracted at less than $80/kg is identified as mineable by ISR methods (IAEA, 2007). Effective restoration of ground water at ISR uranium mines in the U.S. is an essential lifecycle element of these mines. Recently, increasing public pressure has resulted in stronger regulation of this type of mining nationwide and has prompted studies reexamining past restoration efforts such as this ongoing USGS study.

Reference

IAEA, 2007, Uranium 2007: Resources, Production and Demand: A joint report by the OECD Nuclear Energy Agency and the International Atomic Energy Agency, 420 p.